ELECTROCHEMICAL DETECTION OF BIOFILMS

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Biofilms are the result of the adhesion and growth of microorganisms at interfaces and they are part of our daily life [1]. They are microenvironments where several microbial reactions take place, causing considerable chemical changes. In processes where biofilm formation can occur, specially when it is undesirable (e.g., heat exchangers, drinking water pipes), it is very important to detect it as soon as possible, so that action can take place immediately thus avoiding the risks associated with its presence. Biofilm detectors should be capable of detecting clearly small disturbances in the system without disturbing the biofilm structure.

Electrochemical techniques are well known for their role in analytical chemistry allowing a large number of organic, inorganic and biological compounds to be determined and quantified [2]. In the present work, the detection of the early stages of biofilm formation has been attempted and the development of a detector to function *in situ* in flow systems will be described.

The technique used is repetitive cyclic voltammetry applied to a platinum planar electrode of small area introduced in the system, which together with an auxiliary electrode and a reference electrode, constitute an electrochemical cell. When the solution where the electrode is immersed is air-free aqueous sulfuric acid and the platinum electrode surface is clean, the voltammogram shows a well-known defined pattern. Details on this curve depend on the scan rate, on the reversal potential, on the pre-treatment of the electrode and on the solution composition. The application of repetitive cyclic voltammetry to platinum electrodes is in itself a method of electrode cleaning and the appearance of this kind of voltammogram is an indication of the impurities in the surface. This fact may constitute the basis of a method to detect biofilm formation in a flow system, since the smallest deposit on the electrode surface will certainly change the pattern observed when the platinum electrode is clean.

[1] H.C. Flemming, G.G. Geesey (Eds.) "Biofouling and Biocorrosion in Industrial Systems", Springer-Verlag , Berlin, 1991.

[2] R.A. Illsley, S.G. Roscoe, E.D. Jackson, and T.J. Hughes, *Biofouling*, 11 (3) (1997) 191.

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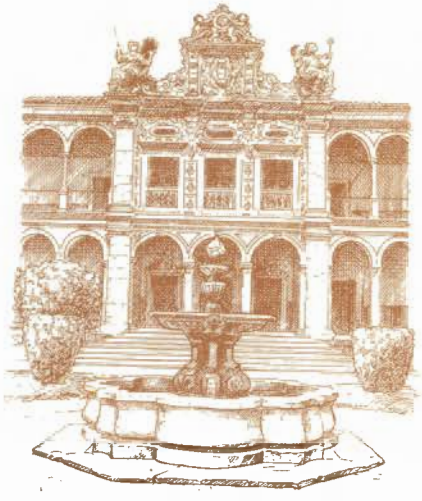

Programa e Resumos

Programme and Abstracts